

NASA's NLSI Expands into the Solar System Exploration Research Virtual Institute (SSERVI)

by Greg Schmidt, Deputy Director, NLSI/SSERVI



NLSI/SSERVI Director Yvonne Pendleton briefs the public on the science of the LADEE mission at the LADEE Launch Event

Focusing Science on the Moon: the NASA Lunar Science Institute (NLSI)

With the advent of the President's Vision for Space Exploration in 2004, the Moon became NASA's exploration target again for the first time since the Apollo program. The Constellation program was set up to implement NASA's bold challenge, and in 2007 a National Research Council study entitled "the Scientific Context for Exploration of the Moon" was published, with major scientific priorities determined by senior lunar scientists involved in the study. At the time, there were few opportunities for lunar scientists; indeed, lunar science itself, while having made progress since Apollo, needed a major boost in answer to the President's challenge. It was in this context that Alan Stern, then Associate Administrator of the

NLSI cont'd on page 3

NASA MSFC and Moon Express Collaborate to Test Flight Software on Mighty Eagle Robotic Lander

by Brad Kohlenberg, Moon Express, Public Outreach Liaison
September 20, 2013

The collaboration is intended to help foster the development of commercial lunar landers for future low-cost missions to the Moon.

Under the terms of a Reimbursable Space Act Agreement signed with Moon Express, NASA Marshall is providing its "Mighty Eagle" lander test vehicle and engineering team in support of a series of test flights to help validate the company's Guidance, Navigation and Control (GNC) flight software. Guidance algorithms developed by Moon Express will be integrated into the existing GNC software on-board the Mighty Eagle and used to perform a flight test series. In return, Moon Express is reimbursing NASA Marshall for the cost of providing the test vehicle and technical support.

The collaborative test flight series is part of a larger Umbrella Agreement between Moon Express and MSFC for Moon Express hardware and testing support. Yesterday the Mighty

Moon Express cont'd on page 3

The Sky Isn't the Limit



Image Credit: NASA Ames / Dana Berry

Artist's concept of NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE) spacecraft orbiting the moon.

While some might claim their aspirations are out of this world, Jason Lohn means it. The Carnegie Mellon University-Silicon Valley professor's communication antennas are headed to the moon as part of NASA's latest mission, the Lunar Atmosphere and Dust Environment Explorer (LADEE), launched September 6.

Lohn cont'd on page 2

CONTENTS

NASA's Solar System Exploration Research Institute (SSERVI) . . . 1

Moon Express 1

The Sky Isn't the Limit 1

New Partners 2

Lunar Orbiter Image Recovery Project 5

IPADE Business School Visit . . 6

LatIPnet: Sustainability and Living Lab 7

NRP Lecture: Planetary Sustainability for Survival and Profit 8

CMU Names Bob Iannucci to Head SV Campus 9

KleenSpeed Collaborates with Oracle Team USA 9

Space Portal Leaders at AIAA Space 2013 10

'Maker' Ideas Wanted for First 3D Printer in Space 11

BASF Extends Agreement with Aprion 11

Scanadu: Tricorders and the Idea of Mapping One's Body 12

RMV Capabilities 13

NASA Begins Exploring Quantum Computing 14

Getting City Commuters Out of Their Car—SkyTran 16

Wyle Sponsors Rocket Launch 17

Kentucky Space 18

Vaspar: Biomimicry and Cooling Technologies for Sports Rehabilitation 19

reQall Rover App 20

Singularity University Features Female Entrepreneurs at CROWDFUNDxWOMEN 21

Intrinsyx's Wireless Technology for Space Applications 21

NeuroVigil Opens Satellite Research Lab 23

NRP Welcomes

Orbital Sciences

Building 19, Rooms 1070F, 1070G
Commencement: December 6, 2013



Orbital Sciences has a long history supporting NASA missions and projects and scientists at Ames dating back to the mid 1990's. Beginning with engineering support to the SOFIA project, they became the prime contractor on the Science and Engineering Technical Support (SETS) contract. Following SETS, Orbital joined with Lockheed Martin as the major subcontractor on the Programs and Project (P&P) contract. As part of the P&P, Orbital supported numerous missions and scientists, including Mr. Bill Borucki and the Kepler Mission, the SOFIA project, the EXES project, and the NASA Astrobiology Institute. More information about Orbital can be found at <http://www.orbital.com>.

Lohn cont'd from page 1

The robotic LADEE mission is gathering information about the lunar atmosphere, surface conditions and environmental impact on lunar dust in an effort to increase understanding of the moon and other planetary bodies. Lohn's antennas will relay this data back to earth.

Lohn has developed software that employs artificial intelligence (AI) to design superior antennas. The resulting devices are more sensitive, better performing, smaller, lighter and less expensive to manufacture. They're also highly unusual.

"Because the antennas are designed by AI, they're unlike anything that a human antenna designer would come up with," explained Lohn, associate research professor of Electrical and Computer Engineering and director of the Carnegie Mellon Innovations Lab. "They're very striking and unique, with an appearance that appears random." The AI-designed antennas often outperform human designs due to these complex, asymmetric shapes that can't be created using manual methods.

It's not the first NASA mission in which Lohn has participated. In 2006, he led a team that deployed three AI-designed antennas in space aboard the Space Technology 5 mission. Just last June, his communication antennas were on board NASA's Interface Region Imaging Spectrograph (IRIS) mission. They relayed data regarding activity in the sun's lower atmosphere, examining the movement of solar material and energy

between the surface and the corona.

The IRIS antennas were developed through Lohn's company, X5 Systems, a CMU spinoff founded in 2008. X5 Systems is a software-based company utilizing advanced optimization algorithms for antenna design.



Jason Lohn

Lohn joined the CMU-SV faculty in 2007, excited to become part of the new campus. "I liked the idea that the Silicon Valley campus was in start-up mode," said Lohn. "It was a chance to make a big difference, to have an impact. I'd known of Carnegie Mellon and its stellar reputation and it was a great opportunity I couldn't turn down."

He was also drawn by the school's entrepreneurial culture.

"The entrepreneurial spirit at CMU was a big attraction," he said. "When I came here, I felt that my antenna technology would reach the point of spinoff and believed CMU's entrepreneurial culture would be supportive." He was completely right.

"I've gotten great support from CMU—the department, the college, and the university administration," said Lohn. "It's just been wonderful."

Story originally published at: www.cmu.edu.

Moon Express cont'd from page 1



NASA's "Mighty Eagle" prototype lunar lander, flying with Moon Express GNC software in open loop test.

Eagle flew a "textbook" flight that helped validate Moon Express GNC flight software. This type of software is designed to tell the vehicle where to go and how to get there and is critical for an autonomous soft landing on the Moon. Moon Express GNC software ran in an open-loop mode on yesterday's flight, operating in parallel to the NASA GNC software. Results from yesterday's flight are an important, progressive step in a series of tests proving and validating Moon Express GNC algorithms that will culminate in a closed loop test on the Mighty Eagle next month.

"We are really excited to begin this new series," said Jason Adam, flight manager for the Mighty Eagle at the Marshall Center. "Working with Moon Express to help test their new software is a great example of the types of partnerships NASA is looking to build."

By utilizing resources and expertise, we can gather data that will not only be used to better NASA's robotic lander program, but can help advance the commercial sector as well."

Moon Express Principal GNC Engineer Jim Kaidy was a member of the Mighty Eagle development team while at the John Hopkins Applied Physics Lab, and Moon Express Chief Propulsion Engineer Tim Pickens supported the development of the Mighty Eagle rocket engines.

"Our partnership with NASA Marshall Spaceflight Center is key to our goal of landing the world's first commercial spacecraft on the Moon", said Moon Express co-founder and CEO Bob Richards. "We have benefitted from NASA's encouragement and support in every step of our growth and development and we look forward to the results of our flight software tests on the Mighty Eagle".

The collaboration involves a high level of integration and coordination between NASA and Moon Express engineers and is representative of NASA partnerships with the private sector to expand commercial space activities.

Moon Express is a leading contender in the \$30M Google Lunar XPRIZE and is headquartered at the NASA Research Park in Silicon Valley with a Propulsion Development Facility in Huntsville, Alabama. The company has been collaborating with NASA for lunar lander development since 2010 when it established a Reimbursable Space Act Agreement with NASA Ames, providing Moon Express access to test facilities and NASA's innovative Common Spacecraft Bus designs currently being flight proven within the LADEE lunar orbiter spacecraft on its way to the Moon.

Story originally published at: www.moonexpress.com

NLSI cont'd from page 1

Science Mission Directorate (SMD) at NASA Headquarters, came up with the idea of establishing a new institute focused on lunar science—a virtual institute based on the successful business model of the NASA Astrobiology Institute (NAI). It is based on the principle articulated by the late Mike Wargo, chief scientist for human exploration, that "science enables exploration, and exploration enables science."

Ames responded quickly to SMD's challenge, appointing David Morrison as the founding director of the NASA Lunar Science Institute and the author as his deputy. The NLSI was given the former Moffett Naval Air Station's headquarters building (building 17) at the heart of the NASA Research Park as its central office, a stately building which once housed the nerve center for the Navy's P-3 fleet. NLSI had its grand opening in April of 2008, with various local and national dignitaries in attendance including U.S. Representative Mike Honda and Apollo 11 astronaut Buzz Aldrin.

The NLSI didn't take long to have an impact on lunar science. In July 2008 it organized the first dedicated Lunar Science Conference in decades, which became an annual event held around the anniversary of the Apollo 11 Moon landing. NLSI leadership was



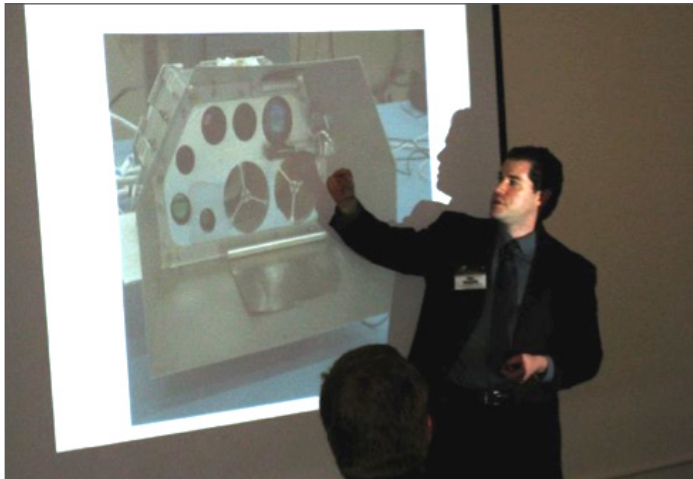
(L-R): NASA Planetary Science Director Jim Green, Representative Mike Honda, Center Director Pete Worden, and former NLSI Director David Morrison participate in the ribbon cutting ceremony commemorating the grand opening of the NASA Lunar Science Institute in 2008.

NLSI cont'd on page 4

NRP Post

NLSI cont'd from page 3

Photo by Teague Soderman



Ames PI Dr. Tony Colaprete describes the LCROSS instruments launched in November 2008, which impacted the moon in 2009—an event witnessed world-wide!

pleasantly surprised to see over 500 scientists, engineers, students and educators at this first Lunar Science Conference (now called the Lunar Science Forum), which galvanized the community and spawned numerous research projects. At this and subsequent conferences, the NLSI introduced the idea of Focus Groups, originally pioneered by NAI founding director and Nobel Prize winner Baruch Blumberg. These Focus Groups—by and for the broad lunar science community—are comprised of members of the community with varying topical interests. Examples include the Lunar Volatiles Focus Group, and the Apollo Lunar Surface Experiment Package Data Recovery Focus Group—the latter aiming towards unearthing data thought long lost for the use of scientists in generations to come.

With the major new emphasis by NASA in lunar science, it quickly became apparent that the community needed to grow to answer these new challenges. A core part of NLSI's mission was developing the next generation of lunar scientists. Each year at the Lunar Science Forum NLSI sponsors "LunaGradCon," a conference for, and organized by, graduate students in lunar science. NLSI also sponsors the Next Generation Lunar Scientists and Engineers group, started by a group of young scientists at NASA Goddard Space Flight Center but including scientists and students around the country. And NLSI has sponsored other student programs and activities as well as postdoctoral fellowships throughout its existence.

It was apparent at the inception of NLSI that unlike the Apollo era, lunar science and exploration is now a global effort with many nations joining in the effort to explore Earth's nearest neighbor. In addition to NASA's missions, the Europeans, Japanese, Indians and Chinese have all launched their own missions to the Moon recently, with plans for the Koreans and Russians to join in this exploration soon. It was clear from the beginning that joining hand in hand with international partners would be a winning strategy for NLSI and would help raise the tide of lunar science around the world. Canada was announced as NLSI's first international partner at the first Lunar Science Conference, and they were soon joined by others including South Korea, the United Kingdom, the Netherlands, Saudi Arabia, Israel and Germany. Discussions are ongoing

to bring several more partners into the fold. These partnerships have impacted lunar science in a number of ways, resulting in such efforts and groups as the Pan-European Lunar Science Consortium and the Canadian Sudbury Field School. The future is even more exciting as both South Korea and Russia gear up for major new mission programs.

At the advent of NLSI, the only recent NASA missions to the Moon had been led by Ames center directors—the 1994 Clementine mission by Pete Worden, then with DOD, and the 1999 Lunar Prospector mission, led by former Ames director Scott Hubbard. Both had produced very important data, but much more was needed by the growing lunar science community. In the mere 5 ½ years since the inception of NLSI, NASA has launched the Lunar Reconnaissance Orbiter—whose data now accounts for a majority of data in the Planetary Data System, the Lunar Crater Observation and Sensing Satellite (LCROSS) mission, the Gravity Recovery and Interior Laboratory (GRAIL) mission and the Lunar Atmosphere and Dust Environmental Explorer (LADEE) mission, which is still orbiting the Moon as of this writing. Additionally, in 2011 the two Acceleration, Reconnection, Turbulence and Electrodynamics of the Moon's Interaction with the Sun (ARTEMIS) spacecraft became the first ever to achieve orbit around the Moon's Lagrangian points. Two of these missions—and in particular, the two which have broken stereotypes on mission costs (LCROSS and LADEE)—have been developed and managed by Ames. These missions together, along with the international missions, have provided a wealth of data for the lunar science community and NLSI in particular. NLSI scientists have been integrally involved in these missions as instrument Principal Investigators and Co-Investigators as well – developers of the ideas behind the missions as well as users of the data.

Another major mission of the NLSI has been to share the excitement of lunar science with the public. Its outreach efforts, both through its central office and its teams, have been many and varied. It co-hosted (along with LCROSS) the MoonFest event, the largest public event at Ames since the 1997 Ames Open House, with over 11,000 in attendance to celebrate the 40th anniversary of the Apollo 11 mission (NLSI leadership was also invited by Buzz Aldrin to participate in 40th anniversary activities on the U.S.S. Hornet, the aircraft carrier currently located in Alameda which picked up the Apollo 11 astronauts). NLSI supported the design and production of "Getting a Feel for Lunar Craters," a unique book designed for the blind community which allows individuals to sense lunar craters by feel as well as read about them in Braille. NLSI supported what was likely the largest-ever eclipse observation in a stadium in Colorado with over 10,000 in attendance, and worked with the National Park Service on a special viewing of the annular solar eclipse at the Grand Canyon in 2012. The NLSI, (and now the Solar System Exploration Research Virtual Institute (SSERVI)), maintains a very active social media program with presence on Facebook, Twitter, Google Plus and Instagram, in addition to articles posted on its website. Its public outreach products have been used widely; the "Lunar Gallery" collection of artistic photos of the Moon with accompanying scientific descriptions have not only been distributed widely to the public but were used in the NASA package for the 2013 Presidential Inauguration. This collection was recently translated into Spanish. NLSI developed "Exploration Uplink," a

NLSI cont'd on page 22

Lunar Orbiter Image Recovery Project at Five

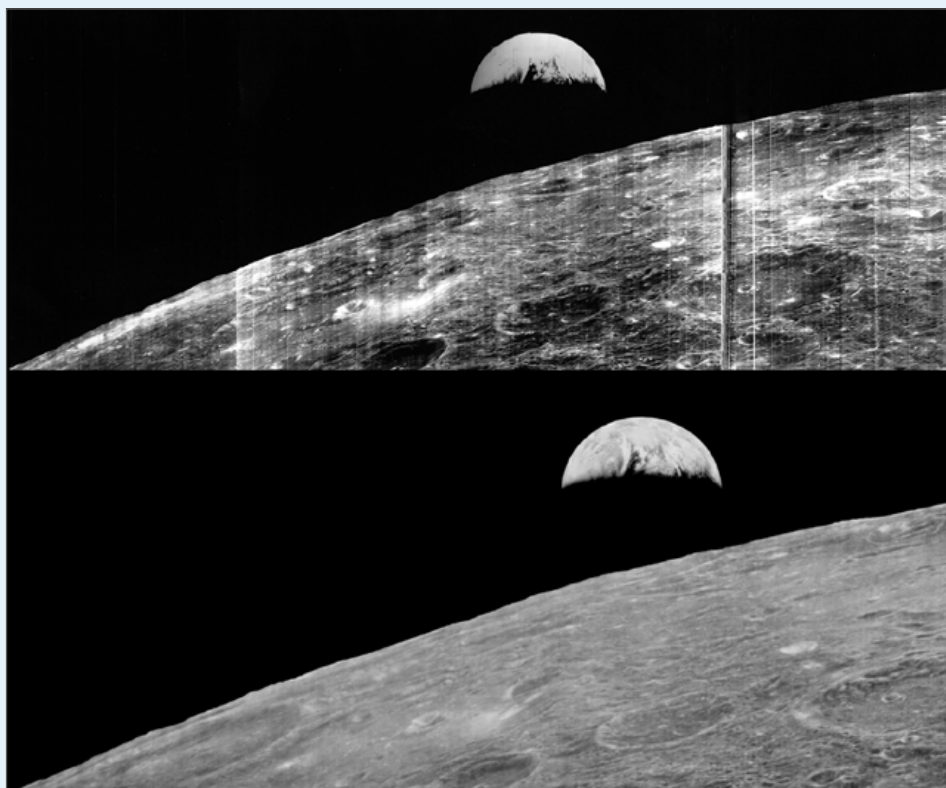
by Dennis Wingo

McMoon's, Earthrise, Technoarcheology, LOIRP—five years ago all of these terms were unknown yet today have hundreds of thousands of hits on the Internet. Such has been the unlikely public appeal of a project to rescue, from the dustbin of NASA history, the original high resolution images from the NASA Research Park project located in the abandoned McDonald's onsite. Much of the appeal has come from this unlikely marriage between the outward appearance an iconic fast food franchise and a NASA related project.

The project is called the Lunar Orbiter Image Recovery Project, or LOIRP. LOIRP's goal is to transfer the original high resolution images from the five Lunar Orbiter spacecraft that first mapped the Moon in 1966. The Lunar Orbiter photos were used to choose the landing sites for the first Apollo lunar landings and are the first science photos of any heavenly body, including the Earth, at one meter or better resolution. The project was started after a random blog post stated that Lunar Orbiter tape drives were being given away by retired JPL archivist Nancy Evans, who had saved the tapes from destruction. The project was kickstarted by NASA Watch raconteur Keith Cowing providing seed money for the move of 28,000 lbs of tape and 4,000 lbs of tape drives from Los Angeles to NASA Ames.

The location suggestion for "McMoons" came from an offhand comment by NASA employee Lynn Harper that perhaps the fumes from soldering could be vented using the old french fryer fans. When Cowling and I started our project in July of 2008, the fast food franchise had just vacated the premises and no one else really wanted the building.

Our presence in the McDonald's almost immediately generated intrigue. An inadvertent posting of pictures of the project spawned Internet conspiracy theories i.e. that McDonald's is owned by former aerospace giant McDonnell Douglas (confusion over spelling), and that the Pentagon had sent former USAF general Pete Worden to be the NASA Ames center director to keep hidden the alien civilization on the Moon to the sublime: a query from NASA headquarters public affairs asking how in the world we were able to get the New York



NASA Image LOI-101H "Earthrise" (1966)

Times to say something nice about NASA? The New York Times article was inspired by our first image, itself an accidental choice of the iconic first image of the Earth ever taken from around another celestial body, shown here in the original and in all of our 2008 restored digital glory.

LOIRP has had many beneficial "accidents" that have helped our project be a success. The first is of course Ames center director Worden's willingness to adopt unorthodox and frequently high risk projects. The second is the openness and willingness of Ames personnel to pitch in and help make things happen. After Harper's stroke of genius came the chance meeting between some of the facilities contractors, one of who's brothers was a long time engineer who had worked for decades on similar type video tape machines (Kenneth Zin) who was available for the LOIRP project. Ken brought with him a coterie of retired who's who from the 60's-80's era video business, one of whom (Al Sturm) was able to whip up the design for the critically important video demodulator that could convert the predemodulation format data on the tapes to lunar orbiter images. Al

recently passed away, but not before NASA headquarters had awarded him the NASA public service medal for his feat of technoarcheology.

Our project has also been blessed with remarkable support from the NASA Lunar Science Institute, first led by Dr. David Morrison, then Yvonne Pendleton and her trusty second in command, long time Ames employee Greg Schmidt. Schmidt and his team understand how to navigate the ins and outs of helping to make an unorthodox project a reality within the confines of the system. Another stellar individual is Mark Newfield, another long time Ames employee who does not know the meaning of can't. The folks over at the "Toy Store"—what we call NASA Ames surplus—have provided us with cast off equipment that, with Ken's magic, we have made into a serviceable source of test equipment, some as old as our tape drives, to make our project a success.

Another amazing resource at NASA Ames has been the students. We began with

Lunar Image cont'd on page 23

NRP Post

IPADE Business School Visits NASA Research Park

by Sophia Varga, LatIPnet

On Tuesday, September 13th, a delegation from IPADE Business School (Instituto Panamericano de Alta Dirección de Empresa) came to NASA Research Park for an Innovators' Workshop organized by LatIPnet. The attendees learned how businesses innovate, collaborate, and adapt technology to the market with several case studies presented by companies associated with LatIPnet.

LatIPnet seeks to transform knowledge into wealth in Spain and Latin American countries. Through a network of experts in intellectual property, technology transfer and commercialization, high-tech businesses, and regional development strategies, LatIPnet has established alliances with prestigious universities and research centers around the world, as well as with global high-tech companies that offer invaluable resources to support the process of transforming knowledge and technological resources into economic and social value.

IPADE is ranked as one of the top Business Schools in the world and is based in Mexico City. Part of the school's mission statement is "To educate [and enable] leaders ... to positively transform organizations, society, and [to] make an impact on the world, embedded with a global vision [and] social responsibility". To fulfill this mission, the school believes in "research, creation, innovation, and transmission of knowledge" as well as "broadening people's horizons" and "learning and entrepreneurship". The workshop served to give real-life examples of the embodiments of these values and how NASA Research Park is a center of innovation. The attendees of the workshop ranged from high-tech entrepreneurs to materials distributors to insurance groups- all interested in developing and financing businesses that have sustainable global impacts, both



Aonori Aquafarms: A novel, sustainable aquaculture for shrimp production- Armando Leon, CEO

short-term and long-term, and committed to moving Mexican companies into modern international markets.

The purpose of the workshop was to demonstrate how collaboration within Silicon Valley creates innovations by learning about NASA Research Park and businesses that LatIPnet has successfully supported. Executives from these businesses gave short presentations about their companies- the original idea, idea-to-market strategies, and current status.

Michael Marlaire, the director of the NASA Research Park (NRP), gave a presentation about the mission, history, and achievements of NASA Ames and the NRP. He then spoke of the new Google Bayview Campus as an example of the collaboration that NRP enables. Marlaire also talked about the Sustainability Base, the only LEED Platinum certified government building, which was designed with cutting-edge ideas and technology regarding resource use and acts as a testing-ground for closed-loop engineering.

The Sustainability Base was one of the examples of a zero net emissions system that LatIPnet looked at when they proposed a self-sufficient, zero-waste development on the island of Fuerteventura (Canary Islands, Spain) that would simultaneously attract tourists and create an area for innovation. The development is called the International Entrepreneurial Laboratory for Touristic Islands Sustainability (IELTIS) and is currently under review from local and Spanish governments.

Through the Innovators' Workshop delegates from the IPADE Business School in Mexico discovered how supporting innovative and disruptive technologies can have effects that cross state lines and improve the quality of life for people globally.

For more information about LatIPnet, visit www.latipnet.org.



Fifteen alumni of Mexican business school IPADE visited the NRP on Sept. 3, 2013. The alumni are CEOs of Mexican companies and entrepreneurs. The group was hosted by NRP tenant LatIPnet, an information technology firm focused on technology companies in Spanish-speaking countries. Dr. Steve Zornetzer, Associate Director for Research, welcomed the group and Michael Marlaire, Director of NRP, provided an in-depth overview of the NASA Research Park.

LatIPnet Invited by Fuerteventura to Help Define a Sustainability Model and Living Lab for Tourist Island

Invited by the government of Fuerteventura, Drs. Simon Goldbard and Adolfo Nemirovsky, founding members of LatIPnet Inc. visited the island to present a model of a sustainable tourist island to local authorities, general public, and academia and industry leaders. The model developed by LatIPnet included valuable input from local and regional leaders and institutions. Additional suggestions and recommendations were provided during the three-day visit.



(L-R): Mario Cabrera, President and Manuel Miranda, Secretary of Economy, Cabildo de Fuerteventura; and Simon Goldbard and Adolfo Nemirovsky of LatIPnet

Pursuing a novel model of sustainability for the tourist industry through international partnerships, Fuerteventura intends to become a pioneer in converting the island into a living lab, a model of sustainability for our planet, with an innovation ecosystem focused on clean tech and sustainable resources: energy, water and food.

Fuerteventura, one of the seven Canary Islands, has a population of seventy-five thousand people and an area of 640 square miles. The Canary Islands, a Spanish archipelago just off the northwest coast of Africa, are located sixty miles west of the border between Morocco & Western Sahara.

LatIPnet Inc., a NRP partner, is a global non-profit 501(c)(3) organization with the mission of transforming knowledge into wealth for Latin countries.



A workshop on building the sustainable tourist island, at the table from left to right, Javier Franco, Adolfo Nemirovsky, Manuel Miranda and Simon Goldbard.



Green Tech Center, Denmark Delegation visited NASA Ames on September 5, 2013. Michael Marlaire, Director of NASA Research Park provided an overview of the NRP partnerships.



Swiss Space Systems (S3) is developing a low cost suborbital launch capability. Their CEO and founder, Pascal Jausi, and three other S3 colleagues visited and toured Ames and NRP on Sept. 20, 2013 to discuss potential synergies with NASA and possible location of their recently incorporated U.S. subsidiary at the NRP.



On December 11, 2013, Michael Marlaire, Director of NRP, briefed Executive Director of Japan Space Forum Shushi Ueta and Izumi Yamashita, Fellow, Center for Research and Development Strategy Japan Science and Technology Agency.

NASA Presentation: Planetary Sustainability for Survival and Profit

by Mark Ciotola, Editor, SustainSpace.com
December 4, 2013

The NASA Research Park (NRP) held “Planetary Sustainability for Survival and Profit”, a presentation and audience Q&A on the evening of December 3 at Moffett Field as part of its Exploration Lecture Series.

Speakers presented on several sustainability-related start-ups at the NASA Research Park, including Bloom Energy, Bio-Vessel (in stealth mode), and Oyokits. Panelists spoke about other endeavors such as the Space Portal, NEX, a warehouse and collaboration platform for Earth data, the UAV Collaborative, and the Smart Energy Enterprise Development Zone (SEEDZ).

Dr. Rose Grymes emceed the event and moderated a lively panel discussion.

Dr. Daniel Rasky surveyed the growing field of space and sustainability. He mentioned the natural connection between space and sustainability by pointing out that Elon Musk has created both SpaceX and Tesla. Dr. Rama Nemani indicated how NEX makes vital data regarding climate change available. He mentioned how the typical scientist will spend



Panelists during the audience Q&A

80% of their time with data and writing software and how NEX can reduce that time, and by implication that scientists can thus improve their impact.

Dr. Stanley Herwitz discussed how unmanned ariel vehicles (UAVs) can be used to gain high resolution environmental data and showed beautiful video of a

UAV flying over the Florida Keys. Mr. Donald Bray, discussed how the Smart Energy Enterprise Development Zone (SEEDZ) in Silicon Valley is producing synergies by integrating the various components of energy production and management.

Speakers/Panelists:

- Dr. Rose Grymes, Office of the Center Director, Technical Lead, Sustainability, GSA Sustainability Fellow 2012-2013
- Dr. Daniel Rasky, Director, NASA Ames Space Portal – NASA Planetary Sustainability Initiatives + Partnerships
- Dr. Rama Nemani, Director, NASA Earth Exchange – NASA Supercomputer-driven Planetary Sustainability Programs
- Dr. Stanley Herwitz, Director, UAV Collaborative – Investigating + Documenting Global Climate Change using UAVs
- Mr. Donald Bray, Director, Smart Energy Enterprise Development Zone (SEEDZ) Initiative, Joint Venture Silicon Valley Network – Green Development/Green Jobs



(L-R): Panelists Dr. Rama Nemani, Dr. Stanley Herwitz, Dr. Rose Grymes, Dr. Daniel Rasky, and Mr. Donald Bray.

Story originally published at SustainSpace.com

Carnegie Mellon Names Bob Iannucci to Head Silicon Valley Campus

Carnegie Mellon University's Bob Iannucci has been named associate dean and director of CMU's Silicon Valley campus, effective Sept. 1. He succeeds Martin L. Griss, director of the Disaster Management Initiative and founder and former director of the CyLab Mobility Research Center.

"I am honored to be named head of CMU's innovative and entrepreneurial campus that sits in the middle of Silicon Valley, the worldwide hub of technology innovation," said Iannucci, a distinguished service professor at CMU Silicon Valley and director of the CyLab Mobility Research Center with a courtesy appointment in the Department of Electrical and Computer Engineering. "CMU's international reputation for research and academic excellence, coupled with the entrepreneurial opportunities here in Silicon Valley, make this campus a truly unique place. I look forward to the challenge and the opportunity."

James H. Garrett, Jr., dean of the College of Engineering and the Thomas Lord Professor of Civil and Environmental Engineering, praised Iannucci for his extensive experience directing research activity at several internationally recognized companies in Silicon Valley. "His stellar research reputation, and his more recent experience as an interdisciplinary educator and researcher at the CMU Silicon Valley campus, make him ideally suited to be the associate dean and director of the CMU Silicon Valley campus."

Prior to joining CMU, Iannucci served as the chief technology officer of Nokia and head of Nokia Research Center (NRC). There, he spearheaded the effort to transform NRC into an open innovation center, creating "labs" at the Massachusetts Institute of Technology (MIT), Stanford University, Tsinghua University, the University of Cambridge and Ecole Polytechnique Federale de Lausanne (EPFL). Under his leadership, NRC's previously established labs and the new labs delivered fundamental contributions to the worldwide Long Term Evolution for 3G (LTE) standard; created and commercialized Bluetooth Low Energy; created and promulgated what is now the MIPI UniPro interface for high-speed, in-phone networking; and

generated many other communications technology innovations.

An entrepreneurial pioneer, Iannucci has led engineering teams at two startups—one focused on virtualized networking and the other on computational fluid dynamics (Exa Corporation, which went public in 2012)—creating systems that offered order-of-magnitude improvements over alternatives. He also served as director of Digital Equipment Corporation's Cambridge Research Laboratory (CRL) and was vice president of research at Compaq. His CRL team (along with CMU's Dan Siewiorek, Asim Smailagic and other researchers from the Institute for Complex Engineered Systems) created MoCCA—a mobile communication and computing architecture that anticipated much of what has become today's smartphone technology.



Bob Iannucci

After receiving a Ph.D. in electrical engineering and computer science in 1988 from MIT, Iannucci led a team at IBM's T.J. Watson Research Center that developed highly scalable computing systems.

CMU's Silicon Valley campus, established in 2002 at Moffett Field, offers master's and Ph.D. degree programs in electrical and computer engineering, as well as master's degree programs in software engineering, software management and information networking.

The campus also offers a novel entrepreneurship program. Designed to capitalize on the speed of the Internet and tech-based innovations in the broader Silicon Valley economy, the CMU program blends both technical acumen and business problem-solving skills in a rigorous 12-month, full-time program.

Story originally published at www.cmu.edu

KleenSpeed Collaborates with ORACLE TEAM USA

October 24, 2013

KleenSpeed Technologies Inc. was given a chance to collaborate with ORACLE TEAM USA and jointly developed the high performance lithium-ion batteries used to power the onboard electronics on the AC72 Race Boats, and the ORACLE TEAM USA Chase Boats.

ORACLE TEAM USA Electronics Team Manager Richard Kent and his team supplied the specifications and together with the KleenSpeed Team led by Laura F. Reyes EVP Global Business Development & Strategic Partnerships; Hugues Marceau Engineer, and Pierre Hinse of EV Fern, developed the winning KleenSpeed GenESSys Marine lithium-ion battery technology that powered the boats instrumentation through 11 races. Timothy Collins, the CEO of KleenSpeed, stated that, "As a Global provider of Lithium-Ion solutions with electric racing wins, KleenSpeed understands the

need for high performance, and reliability; we knew that we could produce the right solution."

KleenSpeed Technologies Inc. is a lithium-ion solutions provider located at the NASA Research Park in Moffett Field CA, with experience in developing high speed and high performance electric race cars, electric vehicles and Lithium-Ion Energy solutions.

ORACLE TEAM USA was founded on Aug. 11, 2000, by Oracle Corp CEO Larry Ellison. Led by CEO Russell Coutts and skipper James Spithill, ORACLE TEAM USA is comprised of the best international sailing, design, build and support talent and successfully defended the trophy on San Francisco Bay in September 2013.

Story originally published at www.kleenspeed.com

Space Portal Leaders Play Key Roles at AIAA Space 2013 Conference

by Bruce Pittman

On September 11, 2013, Dr. Dan Rasky and Bruce Pittman of the NASA Space Portal made presentations at the American Institute of Aeronautics and Astronautics Space 2013 conference that was held in San Diego, CA. This meeting attracted over 800 leading aerospace professionals from all over the world. Bruce chaired a plenary panel discussion titled Space Exploration for Inspiration and Profit. On the panel with Bruce were Dan Dumbacher, NASA Deputy Associate Administrator for Exploration Systems who is in charge of NASA's deep space exploration program; Chris Lewicki, President of Planetary Resources a company that is planning to mine asteroids; and Dr. Bob Richards of Moon Express that is planning to mine the Moon.

In his opening remarks Bruce reflected that the space program was in the middle of a major paradigm shift in which all of the rules for success were being challenged. In particular the rules pertaining to the roles performed by government and industry are being radically altered from the traditional government led/industry supported model that was successfully used for Apollo. In its place is emerging the use of public/private partnerships to leverage increasing scarce government resources and make use of the government as an anchor customer while other markets are developed. The two space entrepreneurs, Chris and Bob, talked about the challenges and opportunities of attempting to bring the resources of the solar system into the Earth's economic sphere and make a profit. They are both taking a stepping stone approach that starts off with small steps and then builds upon them. Mr. Dumbacher talked about NASA's beyond LEO exploration strategy and the Space Launch System and Multipurpose Crew Exploration Vehicle (MPCV) that NASA is developing for this exploration. He also stressed the innovation that they are attempting to bring to the process and the challenges he faces with regards to the uncertainties of the federal budget process. All three mentioned that partnerships and collaboration were key to their progress and success.



(L–R): Dan Dumbacher, Deputy Associate Administrator for Exploration Systems Development, NASA Headquarters; Bruce Pittman, Director of Flight Projects & Chief System Engineer NASA Space Portal NASA Ames Research Center; Chris Lewicki, President and Chief Engineer, Planetary Resources; Robert “Bob” Richards, Co-Founder and CEO, Moon Express, Inc.

On Wednesday evening Dr. Rasky made a keynote presentation on lessons learned from the recently completed Commercial Orbital Transportation Services (COTS) program.

In the COTS program rather than using a traditional government contract, NASA used its congressionally authorized “other transaction authority” which NASA has codified in their Space Act Agreements (SAA). In his talk Dan presented the concept of “commercial leverage” where the government leverages off commercial interest and investment to enable it to meet its mission need. In the case of COTS the need was to deliver cargo to the International Space Station after the retirement of the Space Shuttle. To meet this need, NASA undertook an open competition of space launch providers under a program to demonstrate the capability to delivery cargo to the ISS, and possible return payloads to earth.

The COTS program used funded Space Acts Agreements (SAA's) instead of the usual government cost plus contracts. Under the SAA's the companies are paid only for the completion of mutually agreed upon milestones. This shifts a majority of the risk for

failure from the government to the contractor. It also aligns the business goals of both parties by incentivizing both parties to meet budget and schedule commitments. In just seven years Space Exploration Technologies (SpaceX) and Orbital Sciences were able to design, build, test and successfully demonstrate two launch vehicles and two capsules that could successfully carry cargo to the ISS. In addition, the SpaceX Dragon capsule can not only deliver cargo to the ISS, it can also return three tons of payload back to Earth. The Dragon capsule is currently being upgraded to be able to carry people as well as cargo to the ISS, with the first flights currently scheduled for 2015. A recent NASA audit of the SpaceX Falcon 9 launch vehicle showed that its total development costs was just under \$400 million. When NASA ran the Falcon 9 design through its own cost models (the NASA/Air Force Costing Model, or NAFCOM) the results of the analysis showed that if NASA had undertaken the Falcon 9 development with traditional contracting methods, the calculated cost was almost \$4 billion. This 10X difference in development cost shows the power of the Commercial Leverage Model.

'Maker' Ideas Wanted for First 3D Printer in Space

by Denise Chow, Staff Writer, Space.com
September 23, 2013

A California-based company that will launch a 3D printer to the International Space Station in 2014 is aiming to change the way space agencies think about how they transport goods to the orbiting outpost. But, using a machine to spit out spare parts for the space station is only the beginning.

Built by the firm Made in Space, Inc., the first 3D printer in space will launch to the space station aboard commercial spaceflight provider SpaceX's Dragon capsule. The mission will largely be a proof-of-concept flight, in which astronauts will use the device to demonstrate its functionality in the microgravity environment, Mike Chen, Made in Space co-founder and chief strategy officer, told an audience at World Maker Faire in Queens here Saturday (Sept. 21).

While astronauts will initially use the 3D printer to create spare parts and tools for the space station, Made in Space is hoping "makers" on Earth will get a chance to flex their creativity by coming up with designs for science experiments, innovative projects and artwork.

"Once our printer is there, we're going to be opening it up to the world to print things in space," Chen said, while openly soliciting ideas and encouraging people to contact the company with thoughts.

If all goes well, a permanent version of the 3D printer will be launched to the International Space Station in 2015.

"The paradigm shift that we want everyone to understand is: instead of launching things to space, just print it there," Chen said. "Why would you go through all the energy to build it here and launch it, when you can just build it there?"



Photo by Denise Chow/SPACE.com

Made in Space co-founder and chief strategy officer Mike Chen discusses his company's 3D printer, which is launching to the International Space Station in 2014, at the 2013 World Maker Faire at the New York Hall of Science in New York.

Made in Space was founded in 2010 with the mission of broadening access to space. "[I]t's really expensive and difficult to launch things into space, and that puts a real dampening effect on innovation," Chen said.

Having a 3D printing capability on the International Space Station will open up possibilities for the materials that can be produced in orbit, and the types of experiments that can be performed in space.

"Everything that you launch is going to have to withstand up to 9Gs in the rocket and crazy vibrations," Chen said. "Things in space are vastly over-engineered, really, for the first 8 minutes of its existence. Think about what you can do now that you have 3D printing capabilities on orbit. For the first time, we'll be able to design things for space that don't ever have to exist in a gravity environment."

BASF Extends Agreement with Aprion (Former NRP Startup)

Multi-million dollar agreement names Aprion as core technology and services provider for safety, security, compliance and performance projects

September 3, 2013

BASF Corporation announced today it has selected Aprion as the sole source provider of industrial wireless applications, systems and services for its North America manufacturing facilities. BASF and Aprion have finalized an initial \$10 million purchase agreement for multiple application projects to be implemented over the next two years. These applications will enable BASF facilities to address their industrial safety, security, compliance and performance initiatives via Aprion's systems and services offering. "We decided to pursue this extended relationship with Aprion because of the proven success with various Aprion implementations at our North American BASF facilities to date," said Chris Witte, Site Manager, for BASF's Freeport facility. "In addition to reliable systems, Aprion's services team has consistently exceeded expectations during the engineering and implementation phases of our

current and completed projects. Its ION Managed Services offering was a key factor in our decision to extend our agreement." Aprion, a leading provider of wireless application systems and services, offers a full suite of industrial applications to improve safety, security, compliance and performance at industrial facilities. Core to Aprion's offering is the ION System - an open industrial wireless system that supports all devices, vendors and protocols and integrates all applications in a single platform. The ION System includes ION services and Aprion's full suite of ION industrial applications: mustering; video; communications such as emergency notification; condition monitoring; mobility for operations and turnarounds; personnel tracking; access control; and many more. The new contract covers safety applications such as mustering,

Aprion cont'd on page 15

Personal Tragedy, Tricorders and the Idea of Mapping One's Body

by Quentin Hardy, New York Times



Scanadu's medical device is about two inches wide and a half-inch thick. When held to the forehead, it can measure oxygen intake, breathing and heart rate.

When Walter De Brouwer puts his head to something, he can produce single-handedly what usually takes several hospital machines and labs. His single hand, it should be said, holds a small and promising device with which Mr. De Brouwer, the co-founder and chief executive of Scanadu, hopes to remake medicine.

The object Scanadu is working on is an oval disk about two inches wide and a half-inch thick. Held to the forehead, it uses light to measure oxygen intake, an accelerometer to figure out how far the chest extends in breathing, and a small electrical plate under the thumb to measure heart rate. Other sensors, some still in development, will measure temperature, blood pressure and other body functions.

In some cases the sensors are taking direct measurements, including some from a mild circuit that is created by the loop of the arm to the forehead and through the body, which the device reads and sends to a smartphone app. Still others are planned to deduce more information, using software that draws from among the different measurements.

The Scanadu device is a long way from perfect, despite having been through a significant revision since it was first announced to some hoopla (the "Star Trek" tricorder comparisons came fast) a year ago. In an informal test, it first got my heart rate 60 beats per minute above what it had been in a doctor's office a week before. A few moments later, it seemed absolutely accurate.

And that, in a sense, is part of the point. Rather than taking the rigorous and expensive approach usually applied to medical devices, Scanadu works like a software company. It creates a product, then toys with it, improving the software and tweaking the algorithms. Eventually, both theory and experience show, a product can become pretty good.

"It's all off-the-shelf stuff," Mr. De Brouwer said. His Mountain View, Calif., company hopes to have the device available as a mass

market consumer product in late 2014, for about \$199. "It's the algorithms that are new."

Mr. De Brouwer, a well-known tech entrepreneur, sees the device as only a part of his ultimate goal. "Everyone who comes into a hospital is so powerless," he said. "Why don't we have our own devices, so we can create and take our own data about ourselves?" Once we do, he figures, we can share and pool the data for novel research in a kind of homemade medical hackathon.

Scanadu gained notice when it raised \$1.6 million on Indiegogo, the crowdfunding website. Of the 8,800 people who gave money to the project, he says, some 1,100 were medical professionals (mostly doctors and nurses) in the United States. These contributors will soon receive an early version of the device, and their experience with it will go into further improving the product. Since then the company has picked up another \$10.5 million in funding.

Scanadu has one of consumer tech's more somber creation histories. Mr. De Brouwer, who is originally from Belgium, made a fortune during the first Internet boom, then lost much of it in the crash. He was earning the money back with a financial institution he purchased in 2003, when his son, then 4 years old, fell about 40 feet, landing head first on a concrete pavement.

The child was in a coma for 11 weeks, and eventually lost half of his brain; he is now in a school in California. Mr. De Brouwer spent a year inside a Belgian hospital, looking after his son and learning how to interpret a large number of medical machines. "I didn't know anything about medicine — what a child's blood pressure should be, what oxygenation was, what any of the displays said or how they worked," he said.

Eventually he figured most of them out, and asked an administrator in the hospital's information technology department where all the data was consolidated for collective analysis. "He told me that everything was stored 1:1; it didn't get compared," he said. "To someone from the tech world, this was like something from the dinosaur age."

Mr. De Brouwer hopes not just to sell the device, but also to create a substantial body of people willing to store and share complex medical readings over a long period, measuring effects like stress and heart rates. He's also running a "wet lab," which is looking into a similar test system for urine and saliva.

That could produce both personalized medicine and a kind of collective information about the relationships between, say, respiration, temperature and oxygen intake before the onset of a disease.

The product still needs approval from the Food and Drug Administration, which will look at how people use the device and whether it is safe for individual use. Scripps Translational Science Institute will also be doing a study, drawn from the Indiegogo contributors, on the accuracy of the device.

Story originally published at <http://bits.blogs.nytimes.com>

RMV Capabilities

by Renee Mitchell, President, RMV Technology Group LLC.



Robotics Troubleshooting in the RMV Lab

RMV Technology Group LLC, a California Certified Disabled Veteran Business Enterprise (DVBE) located in Building 19 is a fully equipped ESD laboratory for evaluation of ESD materials and system level IEC 61000-4-2 testing of components, parts, sub-assemblies, LEDs and other ESD Sensitive Devices. RMV engineers measure, troubleshoot and validate automated equipment, robotics, equipment centers and satellites in high bays.

ESD Control extends far beyond work station certification and must include validation! When ARC needs to determine if materials will tribocharge in space, then RMV can provide the SME "know how" necessary to measure resistance, electrostatic decay, charge retention, triboelectrification, ESD events and other tests necessary for qualification and mitigation. Cable harness assembly produces electrostatic fields and FIM discharges during connection or launch. Onsite at NASA Ames, RMV can benchmark ESD performance during dynamic shock & vibration testing. For NASA contractors and University partners, RMV not only conducts advanced level computer interfaced interactive ESD "hands on" instrument driven training, but also as a 3rd party, RMV reviews and can recommend design changes for space bound circuit cards.

With testing of ESD materials for space bound applications becoming even more

critical due to the surge of supplier non-compliance and suspect counterfeiting of Asian Pacific sourced components, parts and static control materials, the need for test and evaluation is stronger today than ever before!

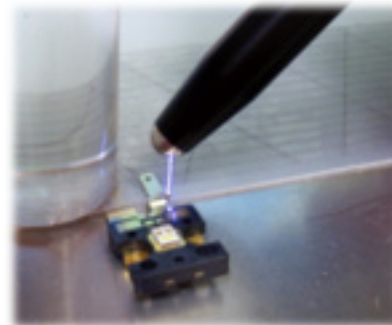
It is unprecedented for any organization to circumvent qualification & validation testing in order to reduce costs for payloads bound for space. Reliance on a vendor specification sheet as proof of qualification opens the door to product non-conformance or suspect counterfeit materials. Bottom line - if you do not test, you do not have much of a program.

An LED under test per IEC 61000-4-2 is performed in house at RMV. One cannot issue a Return Materials Authorization (RMA) for space bound materials as qualification testing is critical to flight systems before launch.

Bob Vermillion, CEO/Founder, is the first in the Aerospace & Defense Industry to identify, publish and present on Non-Compliant & Suspect Counterfeit ESD Materials in the Global Supply Chain before and during the NASA Quality Leadership Forum (QLF) in 2010.

Today's trend in overlooking the initial product qualification with reliance on supplier claims constitutes one root cause for ESD damage and failures in harsh environments. Using NIST traceable equipment, RMV can develop and implement an ESD test plan and troubleshoot while testing space bound materials and products for supplier conformance in a Trust but Verify format.

As part of RMV Technology's efforts to educate the aerospace & defense community on the issues of Supplier Non-Compliance and Suspect Counterfeiting of components and materials, Bob Vermillion will conduct a workshop for the CALCE SMTA Counterfeit



LED System Level Testing

Conference (10-21 November 2013) plus two white papers (one in collaboration with Boeing) for the DMSMS Conference (3-6 December 2013) that addresses the need for periodic testing of supplier materials throughout the product life cycle that is listed on the Corporate Materials Qualification List (MQL).

Failure in space due to supplier non-compliance or suspect counterfeiting is not an option! Ultimately, it is the taxpayer who funds a Federal project. Doing it right the first time is the only way to insure that all parties have come to the table so that NASA, the OEM and supplier reduce their risk.

If a Federal agency or prime contractor thinks that testing can be substituted for reliance upon a vendor specification sheet, then think again.

RMV Technology Group LLC, a NASA Industry Partner, provides technology engineering services, 3rd party ESD test and evaluation of engineered materials and composites, system level testing and ESD/EMC Training for the scientific and engineering community. For more information, contact Renee Mitchell at 650.964.4792 or email renee@esdrmv.com.

NRP Post

NASA Begins Exploring Quantum Computing

By Frank Konkel, Federal Computer Week Staff Writer
Nov 22, 2013

Deep within the recesses of NASA Ames Research Center in Mountain View, Calif., a small team of researchers is beginning to run applications on a revolutionary machine that could pave the way for a new era of computing.

After delays caused by the partial government shutdown, scientists in NASA's Advanced Supercomputing Division are running applications on the D-Wave Two to probe the possibilities of quantum computing.

NASA's early experiments with the computer, developed by D-Wave Systems, are geared toward optimizing aeronautics and other processes vital to the agency's mission, said Rupak Biswas, deputy director of the Exploration Technology Directorate at Ames. But in these primordial days of quantum computing, every experiment will serve as a benchmark for where the technology is and where it might go, he added.

"From our perspective, we are trying to get better answers," Biswas said. "Am I getting the same solution as a classical computer, but faster? Second, if I didn't get a faster solution, did I get a more accurate one? And third, did I find solutions that a classical computer never found?"

In the next five years, NASA will share access to D-Wave Two as part of a three-way partnership with Google and the Universities Space Research Association. USRA's team has not yet carried out tests with D-Wave Two, but Google engineers have been busy refining classical computing algorithms to pit the processing capabilities of today's computers against the D-Wave Two.

NASA's efforts have been more mission-oriented, but neither NASA nor Google expects to publish research results until early next year.

In traditional computing, data is encoded as either a 1 or a 0, but a quantum computer's use of quantum mechanical phenomena allows a quantum bit, or qubit, to represent a one, zero or both values simultaneously.

The simultaneous calculation is the key.

Even today's fastest supercomputers, which crunch trillions or more operations per second, carry out only one operation at a single moment in time. There is no classical computing approach in today's desktop PCs or supercomputers equivalent to the way the qubit allows information to be processed.

Biswas said NASA's efforts on the 512-qubit D-Wave Two have concentrated on planning missions, scheduling processes and re-analyzing portions of data collected by the planet-seeking Kepler telescope. In mission planning, NASA might use its quantum computer to come up with the optimal navigation plan for the Mars Curiosity rover, with variables that include various stop points and resource limitations.

NASA also wants to use the quantum computer to schedule supercomputing jobs. At Ames, NASA's Pleiades, one of the most

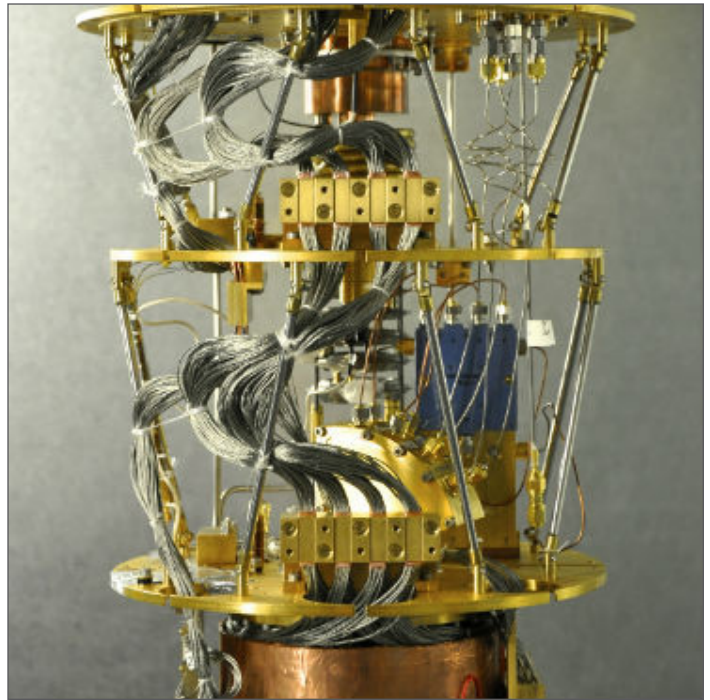


Photo by NASA

The dilution refrigerator inside the D-Wave Two quantum computer cools the processor to 20 millikelvin—more than 100 times colder than interstellar space.

powerful supercomputers in the world, constantly runs jobs but almost always has open nodes available for more work. Assuming 1,000 nodes are available to carry out a 500-node job, Biswas said the quantum computer should be able to sift through a gargantuan number of node combinations to tell NASA engineers exactly which 500 nodes to use for optimal results. NASA currently uses a classical computing approach to guess which nodes to use.

Finally, NASA is beginning to use D-Wave Two to look at the light-curve data of stars collected by the Kepler telescope. The quantum computer has nowhere near the capacity to sift through all the Kepler data, but if it looks at a small portion and finds additional planets hiding within, it would be a groundbreaking moment in quantum computing.

NASA will develop further experiments with D-Wave Two based on the results of the initial applications.

Challenges and questions

About the only thing D-Wave Two and a classical computer have in common is the word "computer."

D-Wave Two takes about one month to boot up because of the complex calibration necessary, and its 512-qubit Vesuvius processor operates at 20 millikelvin, which is 100 times colder than outer space. Without shielding to protect it from Earth's magnetic field, the machine would be nothing more than a large paper weight.

The biggest challenges, however, come in its actual use. Classical algorithms and quantum algorithms are not interchangeable, and a lot of work goes into feeding the right information to the D-Wave Two.

Quantum cont'd on page 15

Quantum cont'd from page 14

First, engineers have to map a problem in quadratic unconstrained binary optimization, a mathematical model for any optimization problem and the input form required by any variant of quantum computer. Biswas said there is not a set way to do this, so engineers use a variety of math tricks to convert optimization problems to QUBO.

The larger challenge, though, is taking the QUBO form of the problem and embedding it into the D-Wave Two hardware.

All 512 qubits on the machine are not totally connected, yet problems require multiple qubits to work “in such a way that they actually represent a single vertex on your graph,” Biswas said. D-Wave Two’s 512 qubits are composed of 64 unit cells. Each unit cell is made up of 8 qubits, four on one side and four on the other, with each qubit composed of a bipartite graph.

“How to embed QUBO onto quantum architecture is the real problem,” Biswas said, adding that the process can be “convoluted and can take a lot of work.”

Once a problem is embedded in quantum architecture, D-Wave Two produces answers in the form of probability. In classical systems, calculations carried out repeatedly that measure unchanging variables such as height or weight produce the same results. That is not the case in quantum systems where measurements change the system, Biswas said, so engineers typically run a problem thou-

sands of times or more and then examine the probability distribution and measure value accordingly.

It is far from simple science. Questions even remain about whether D-Wave Two is a true quantum computer.

“We don’t know yet,” Biswas said, but he added that thus far, the machine clearly demonstrates quantum tunneling and superposition—two important features of any quantum computer. Less clear is whether D-Wave Two exhibits quantum entanglement across unit cells beyond those interconnected 8 qubits.

Regardless, the most important thing will be determining “whether this device, whatever it might be, might solve problems better than classical machines,” Biswas said.

NASA plans to upgrade the machine to 2,048 qubits in the next year or two and potentially to 4,096 by 2018, depending on budget and results. Biswas envisions an ecosystem developing around quantum computing in the next five years, with the potential for finding better ways to convert problems to QUBO form, advancements in embedding QUBO into quantum architecture and improvements in linking qubits together.

“We believe, just like 50 years ago with classical computing, we are in the early days of quantum computing,” Biswas said. “Clearly, it has moved one step forward and is no longer conceptual.”

Story originally published at www.fcw.com

Aprion cont'd from page 11

personnel location and emergency notification and future plans for monitoring and video at numerous BASF facilities in North America. “BASF has made it clear that safety, security and compliance are top priorities at its facilities,” said Doug Donzelli, Aprion CEO. “BASF’s management teams take a proactive approach to utilizing technology for these projects. We initially worked with BASF to implement perimeter video security, condition monitoring and mobility projects at its Freeport, Beaumont and Port Arthur, Texas; and Geismar, Louisiana facilities. These BASF facilities started their wireless application projects with strategic plans and well thought-out implementations. All projects have proven successful to date and we look forward to our continued arrangement with BASF.” As the sole source provider, Aprion will equip multiple BASF facilities with the ION system which includes ION hardware and services and Aprion’s full suite of ION applications

- **ION hardware** – world-class, industrial grade hardware devices designed to integrate and extend leading IT devices. The Aprion ION hardware family includes IONizers, industrial wireless network application, IONite personnel tags and IONizer asset tags.
- **ION services** – Site planning, design, implementation and unique managed services offering with around-the-clock networking monitoring from industry expert.
- **ION applications** – ION mustering, ION video, ION condition monitoring, ION mobility and more.

Story original published at www.basf.com



On November 20, 2013, guests from Recoapp, Finnish Delegation visited the NASA Research Park. OTANIEMI is the largest high tech park in Finland and is Finland’s Silicon Valley. Meighan Haider, Deputy Director of NASA Research Park provided an overview and they also visited Vasper Systems.

Getting City Commuters Out of Their Car and Into the Air - SkyTran Is the Future of Urban Transport

By Jerry Sanders, SkyTran CEO



Image courtesy of: www.skytran.us

Concept image of SkyTran's personal rapid transit system

Traffic is too heavy. Rush hour is too long. Highways are too narrow and byways too slight. Our roads are congested, backed-up, overcrowded, and bumper to crash-proof bumper...

The urban environment as we once knew it is gone. Most of the world now lives in mega-cities; cities that for one example begin in San Francisco and end 50 kilometers south in San Jose. And commuters in these new urban sprawls typically spend two to three (and sometimes four) nerve racking, stress inducing, non-productive hours each day going back and forth to work. Revealingly, these commuters prefer to spend their commuting time in the privacy of their own car and not in public transportation. Indeed—and despite all government incentives—the overwhelming majority of commuters will not even join a car pool, let alone use one.

A recent study by 2e2, an ICT services company showed that commuting costs UK companies over \$4 billion dollars a year. The American Public Transportation Association established that traffic congestion costs the US over \$63 billion dollars a year. And according to other recent authoritative studies, German motorists time in traffic leads to the loss of nearly \$5 billion dollars a year, while Indian traffic jams and toll plazas cost that nation over \$10 billion dollars a year.

These statistics and many others make it clear: if we are going to preserve our ability to move about our cities, alleviate congestion, reduce pollution, and make all of our lives more enjoyable by getting at least some of the commuters out of their cars, we must provide a transportation solution that combines privacy, speed and comfort.

Some folks advocate electric busses. But these combine all of public transportation's worst features: they get stuck in surface traffic, follow (and usually miss) their own schedules, and are crowded in rush hour, and empty during the day. Others argue for subways.

And, yes, subways do move below the traffic, and are generally convenient. But they are certainly not private. Subways also take a long time to build, and cost a lot of money. How much time and how much money? Well, one mile of New York City's Lexington Avenue line was over ten years in the making and cost \$2 billion dollars...

And so we come to SkyTran: elevated, high-speed, low-cost, silent and "green", personal rapid transportation.

- **Elevated:** SkyTran flies above the surface traffic and roads. Flies—yes, flies. SkyTran is a unique velocity-based adaptation of passive magnetic levitation. To the uninitiated that means that SkyTran vehicles fly in a self-generated magnetic field using a magnetic wing. And they do so without generating harmful magnetic emissions.
- **High speeds:** How does 150 MPH grab you? SkyTran is the only system of its kind that can connect the urban to the suburban to the ex-urban.
- **Low-cost:** Less than 1/10 to 1/20th the cost of light rail systems.
- **Silent:** As in "whoosh". SkyTran rides on a cushion of air: no rail-on-rail, no rubber on the road.
- **Green:** SkyTran vehicles use less than 1/2 the energy of a hybrid car. And SkyTran returns energy directly into the grid, without resorting to inefficient batteries.
- **Personal:** Get in and go. No waiting on bus or train schedules, no stopping at other people's stations, no intrusive commuters reading your emails.

Can SkyTran enable you to get from here to there? We think so. And we welcome you to learn more about us and join us in the campaign for smarter, cheaper, faster, public transportation.

Originally published at www.huffingtonpost.co.uk

Wyle Sponsors Rocket Launch with an Eye towards the Future

by Catherine J. Tsairides and Danice Wilson

Wyle has long been involved with America's space programs and continues to support efforts in this important arena as private U.S. entities collaborate with NASA to develop and launch smaller more efficient rockets capable of carrying smaller, more technologically advanced payloads into space.

This year Wyle partnered with NASA and other organizations to sponsor the Mavericks Civilian Space Foundation in fostering future space technology and exploration and the next generation of space explorers during the foundation's annual Research and Education Rocket Safari in Nevada's Black Rock Desert, held Sept. 14–17.

The Mavericks' vision is to enable the common man to build and operate vehicles and small spacecraft that can conduct space exploration missions in near-space, sub-orbital space, orbital space and even planetary exploration one day.

Through next generation space research and technology development conducted with undergraduate and graduate partnering university students, the foundation creates and flight-qualifies reference designs that can be replicated and enhanced by fellow civilian space explorers under creative common licensing. The foundation then uses those reference designs in high school and middle school STEM education programs they establish and operate to inspire and engage the next generation of space explorers worldwide.

This year their rocket safari took place just days before successful commercial launches by Orbital Sciences and Space-X that highlighted the greater roles private interests will play in space technologies and exploration in the future and the importance of developing and cultivating those who will one day lead these efforts.

The safari brought together high school students from the San Francisco Bay area and students and alumni of University of Maine with industry experts to get hands-on advanced rocket operations and space exploration experience. It also supported the University of Maine's URSA space flight mission with the FAA flight qualification of Maverick's new sounding rocket reference design and additional rocket launch operations, vehicle tracking and recovery, and mission payload operations.

URSA Mission sponsors included NASA, Maine Space Grant, and Mide Technology Corporation. Sponsors for the week's events included, Dassault Systemes, Solidworks, the Margaret Jonsson Family Foundation, Digital Solid State Propulsion, and Wyle.

The main event for the week was the flight qualification launch of the Delta P sub-orbital sounding rocket, an URSA Class reference design sounding rocket developed by Mavericks with several University of Maine senior engineering students, in completion of milestones by Mavericks' associated with their Space Act Agreement with NASA. In addition to the qualification test flight, the students were also conducting on-board scientific supersonic fluid flow studies, as well as testing some next generation smart materials sensors and instrumentation associated with their work with Mide Corporation.

The Delta-P team prepared more than a year for the URSA Mission. "From an engineering point of view there were a lot of things that worked well," said Luke Saindon, the student lead on the project. "The airframe flew straight and true. We had our procedures figured out and we knew how to work together as a team—not getting too snippy with each other most of the time. That was very successful, so I think we have a good template for how to go about building and designing the next vehicle."

According to Thomas Atchison, a Tripoli certified experimental amateur rocket developer, civilian space explorer, and founder of the Mavericks Civilian Space Foundation, the foundation mentored the development of this sounding rocket in support of the foundation's astrobiology research work with NASA Ames Research Center. It will make it available through common creative license as a reference design on its new space exploration education and research Internet portal developed under a grant by NASA Ames, for high school and university students in STEM education programs nationwide.

"We became good friends with the Mavericks, initially out of necessity," said Gerard Desjardins, University of Maine alumnus and member of the rocket project team, who is now conducting graduate work and heading up one of the small satellite teams at the University of Colorado. "With a project like this, there are a lot of legal obstacles like FAA waivers. When we contacted Tripoli Rocketry Association, they sent us straight to Tom (Atchison). The Mavericks were able to deal with these things we had no idea about."

"Now, I can ask questions that other students might not ask because I have the experience to look back and say, 'What about this?'" said Michael Ostromecky, a current mechanical engineering student at the University of Maine with hopes of continuing development of his own rocket project there. "At the end of the day, you walk away with a more robust knowledge that you've learned from application that you can't get anywhere else. That's really valuable and I don't think I've quite grasped how much this experience will help me."

"Wyle's involved with the Mavericks because we are seeing the future of satellite technology getting smaller and smaller, even to the size where you can fit an individual satellite in your hand," said Jim Juve, a director of program development in Wyle's ST&E Group.

"And that means you can use smaller and cheaper rockets to get those satellites into space. It also means that smaller technology opens up the rocket launch industry to a new class of companies that are entrepreneurial based, creative and highly motivated. We see the seeds of that with students during the Rocket Safari."

For more information on the Mavericks Civilian Space Foundation, you can follow them on Facebook at <https://www.facebook.com/pages/Mavericks-Civilian-Space-Foundation/130245926994946>. You can also watch their Emmy Award Winning documentary through their website at <http://www.rocketmavericks.com/>

For more information on Wyle, visit www.wyle.com

CASIS Reaches Agreement with Kentucky Space to Advance Regenerative Research

On October 3, 2013, the Center for the Advancement of Science in Space (CASIS), which was selected by NASA in July 2011 to maximize use of the International Space Station (ISS) U.S. National Laboratory, announced an agreement with Kentucky Space LLC to facilitate biomedical research on the ISS.

Dr. Mahendra Jain, principal investigator for Kentucky Space, has proposed an experiment to study regeneration in planarians, which are flatworms capable of rebuilding body organs and nervous systems after damage. In partnership with Dr. Michael Levin of Tufts University, Dr. Jain will examine the effects of the space environment on these enhanced healing abilities. Gravity, and the lack thereof, influences the way cells behave and their ability to rebuild tissue. Studying planarians in space may reveal new aspects of how cells rebuild tissue, which could lead to breakthroughs in medical treatments for humans. For example, regenerative medicine has the potential to treat conditions like Parkinson's, heart disease, or lost limbs.

"CASIS is excited to forge a partnership with Kentucky Space," said CASIS Research Pathway Manager Dr. Michael Roberts. "Regenerative research in model organisms in microgravity may yield incredible benefits to accelerate the treatment of human disease and injury, improving life on Earth and creating a foundation for additional inquiry to better understand the more debilitating conditions we as humans face."

CASIS evaluates unsolicited proposals on a regular basis for scientific and economic merit and potential impact. In some instances, CASIS can provide funding to assist highly qualified research to be performed on the ISS U.S. National Laboratory.

For additional information about unsolicited proposals, including instructions on submitting research ideas, please visit: www.iss-casis.org/Oportunities/UnsolicitedProposals.aspx

Kentucky Space Announces Successful Satellite Launch

November 20, 2013

Kentucky Space LLC (KS) announced early today that at 8:15 PM EST last night KentuckySat-2 (KySat-2) was launched from the NASA Launch Facility at Wallops Island, Virginia. Shortly after lift-off the spacecraft was successfully inserted into orbit at 500 km x 500 km @ 40.5 degrees. Ground operation stations in Kentucky, the US and Japan have reported receiving data packets from the satellite indicating that systems are functioning normally.

KySat-2 is a 1.3 kg (approximately 3 pound) CubeSat class satellite whose primary mission involves a technical demonstration of a stellar gyroscope—an innovative imager and mathematical models to determine spacecraft dynamics. KySat-2 was launched as a secondary payload on the Operationally Responsive Space (ORS-3) mission on an Orbital Sciences Minotaur rocket. KySat-2 was selected for flight by NASA's Educational Launch of a Nano-satellite (ELaNa) program. The KySat-2 spacecraft was designed and built exclusively in the state by Kentucky Space along with its partners Morehead State University and the University of Kentucky. Students at these universities made up the core of the spacecraft design/build team. This launch represents another major milestone in the growth, impact and reach of Kentucky Space said KS Mission Director Twyman Clements.

The mission team from Kentucky Space, including students and faculty from the universities, were on-site for the launch.

Kentucky Space is a private nonprofit enterprise focused on entrepreneurial, educational and commercial space solutions.

For additional information relating to the launch contact Kris Kimel at kkimel@kentuckyspace.com or 859-229-6161 or Twyman Clements at tclements@kentuckyspace.com or 859-229-2719. For information on the program please visit kentuckyspace.com.

Kentucky Space Confirms Successful Operation of Tiny Experimental Spacecraft

Eagle-1, a PocketQube class satellite that measures 5 cm x 5 cm x 15 cm and weighing just 430 grams (just under one pound), was launched on November 21, 2013, on a DNEPR-1 rocket from Dombrovsky Cosmodrome at Yasny, Russia.

This extremely small experimental satellite (which is one of, if not, the smallest functional spacecraft ever placed in orbit) was deployed in orbit by a larger satellite Unisat-1 developed in a partnership between Kentucky Space (KS), Morehead State University (MSU) and the University of Rome La Sapienza Aerospace Engineering School and a commercial spin-off called the Group of Astrodynamics for the Use of Space Systems (GAUSS, Inc.). Since the November launch KS ground ops has confirmed that Eagle-1 is functioning normally with all systems performing as expected.

This class of satellite, which was originally proposed by MSU Professor Robert Twiggs, further demonstrates the power and potential of new micro technologies in space. Eagle-1 was designed and built by Twiggs, KS and MSU students along with the involvement of Dr. Garrett Jernigan and students at Sonoma State University in California.

The PocketQube class satellite is envisioned to have a wide range of applications including: space network nodes, sensor platforms, inexpensive test-beds and novel satellite constellations that are inexpensive, redundant and spatially organized.

Kentucky Space is a private nonprofit enterprise focused on entrepreneurial, educational and commercial space solutions. For additional information relating to the launch contact Kris Kimel at kkimel@kentuckyspace.com or 859-229-6161 or Dr. Benjamin K. Malphrus at b.malphrus@moreheadstate.edu or 606-776-2390. For information on the program please visit kentuckyspace.com.

Biomimicry and NASA's Cooling Technologies are the New Frontier in Sports Rehabilitation

by Jeremy White, Wired Magazine

Photo by Cody Pickens



After an open dislocation of her ankle during a training accident in 2011, the Vasper machine sped up Ashley McLain's recovery

In the heart of Silicon Valley, at NASA Research Park in Mountain View, California, in an unassuming one-story building, Peter Wasowski believes he can transform fitness regimes, and in the process heal both bodies and minds.

Combining cooling and compression pads that hold blood in the upper arms and thighs, his Vasper (short for vascular performance) fitness system fools the brain into thinking it has been working flat-out for several hours, when in fact it has only been exercising for 20 minutes. It sounds like an infomercial for an abs machine that promises the Earth for little effort, but Wasowski's team has been getting startling results—as have high-profile test subjects such as US Olympic athlete Erica Ashley McLain (pictured), who used the system to recover from a serious ankle injury.

The concept is to biomimic the physiology of children. "Watch a child and you do not see them walk—they move quickly, they play and expend a tremendous amount of energy," says Wasowski. "If you were to look inside their muscles you would see high concentrations of lactic acid, and the higher the concentration, the stronger the feedback to the brain requesting growth hormones and other anabolic hormones, such as DHEA, IGF1 and testosterone, which rebuild damaged tissues."

Once humans reach puberty, the body, being much bigger, can no longer concentrate lactic acid at previous levels. At the same time, metabolic rate slows along with the growth process. "So every ten years after puberty, we lose 14 percent of what we call endogenous growth hormone release." According to Wasowski, a 16-year-old athlete is already running at 86 percent of growth hormone, not 100 — and this slows recovery. By contrast, a footballer with an injured knee given six to ten weeks to recover completely can, supposedly, hit the Vasper machines and be match-fit in two weeks.

"We concentrate the lactic acid in the quads and biceps, and we fool the brain into believing that the athlete has just run up a

600-metre-high mountain, and all those muscles are damaged. So the brain releases massive amounts of endogenous hormones to rebuild the muscle tissue, and anything else that requires repair gets repaired, just like it would with a small child."

Along with this biomimicry, Vasper relies on cooling technology modelled on NASA spacesuits to aid healing and performance. Wasowski explains: "If you were to take a bowl of water and heat it over a flame, you would see it starting to warm up and oxygen coming out of it. The same thing happens to the bloodstream. As your body temperature goes up, the blood temperature increases and starts releasing blood oxygen. The less of that oxygen you have on board, the more you start gasping for air. You hit the wall, or the 'O₂ max'—the ability of the body to metabolize oxygen. And that's when your performance goes south."

Wasowski says that in swimming, as blood has much higher blood-oxygen volumes because the temperature is cooler, this type of exercise burns 45 percent more fat as the body is giving maximum fuel to the muscles and running at a much higher efficiency.

"We're duplicating that scenario out of the water," he states. "We have a temperature gradient, between 4.5 degrees celsius and 12 degrees celsius, where we cool the chest, head and feet. So during a 20-minute session you get the benefit of a two-and-a-half-hour workout."

These ultra-efficient workout sessions have generated some compelling improvements in performance: "We had a triathlete here who did only ten sessions. Then she flew to Hawaii and did an Iron Man race. After those ten sessions, she took 50 minutes off her race time—50 minutes."

Vasper is also working on a special programme with US Navy Seals to explore the benefits of the system for troop training. The US Navy refused to comment, but, particularly in this area, Wasowski has noted extraordinary mental rewards using the equipment.

"There are tremendous issues with post-traumatic stress syndrome in the military. And this technology works very well to help those soldiers regain their mental balance, because hormonal balance has a very close relationship to mental balance. We've seen amazing turnarounds with people close to being suicidal who were fine after doing this therapy."

Wasowski expects to have data published on Vasper this year from studies conducted by the Navy Seals, the University of Hawaii and an additional base setting up next month at University of California, San Francisco. For now, he offers himself as further evidence of Vasper's efficacy, having used it to rid himself of arthritic pain in both ankles. He now takes no arthritis medication whatsoever.

"People say, 'This must be a dream come true.' But it's beyond a dream."

NRP Post

reQall Rover: The App That Organizes Your Day

by Shalini Kathuria Narang

October 10, 2013

Welcome to the world of anticipatory assistance where you don't need to search for the information you require, it is served to you on a platter. Or rather, it will appear on your smartphone without you having even asked for it. And very soon, it will be available on any smart device, be it a tablet, a pair of glasses or a watch.

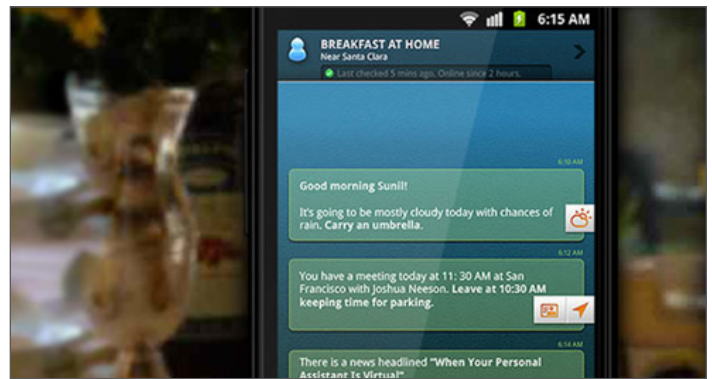
Your proactive personal assistance will not only provide you information about your local traffic, weather, nearby restaurants, etc. but also anything else you can think of. You can also hear the information instead of having to read it. You can get an audible summary which can be listened to even while you are brushing your teeth, bathing or driving.

One of the players in the field of predictive personal assistance computing is reQall Inc. It started off with an app named reQall—a location-based to-do list or memory aid of sorts that was created at the MIT Media Lab.

Today the company boasts a robust platform that corporate houses can build their customized predictive searches on. To showcase the potency of the platform, the company has an internal app called reQall Rover—a personalized, location-based app providing information on various things. reQall Rover uses location, time of day, and other contextual information to provide quick capsules of information.

If you connect it to your email and social networks, it can process even more information - such as the kind of news you like to read or information about your specific commute. It can even pick out important points from your email and Facebook feeds, summarizing the content for you when you don't have time to read it. If you have a meeting coming up with a bigwig from another company, it'll see this on your calendar and provide you information about that person from sources like LinkedIn. reQall Rover is an intelligent, proactive assistant that continuously data mines past, current, and future context and offers assistance unprompted. It doesn't sit idle waiting for the user to ask a question before offering assistance.

"What our platform does is offer a palate of assistance that companies across varied domains can license to build on. Some of the top areas of need for personal assistance that we are seeing are email assistance, including email summarizing, commute assistance, biography assistance, meeting help and taxi booking," says Sunil Vemuri, Co founder and Chief Product Officer at reQall Inc.



ReQall Rover app

"Our business model is licensing the technology which companies can then customize. We concentrate on building and fine tuning our platform on which companies can build their own apps of personal assistance."

Comparing their offering to Google Now, Vemuri says, "Google Now is a closed environment that companies can't augment, change or build on or customize whereas the reQall platform is customisable. Companies in a variety of industries can build on it to customize personal assistance for their customers."

"Also, if a company uses Google Now, Google owns the data. A lot of companies do not want to share their data. Companies using the reQall platform do not need to share their data. The reQall platform offers email assistance and we also have the technology for gauging what activity the user is engaged in, how much attention he or she can give and can filter information that comes to a user based on the activity. For example, if a user is in an important meeting, he/she might get a message from a spouse but not a message that can await a response," adds Vemuri.

Proactive personal assistance has expanded people's imagination on what technology can do. This is just a start. Commenting on some of the requests for personal assistance they get from their partners, Vemuri adds, "Personal assistance in travel scenarios where a smartphone can act like a travel guide, or requests for engaging users to not just react to a doctor's advice but to proactively engage in improving the quality of their health like reminders set for exercising or eating right etc. are some of the many areas that we are getting requests for from various verticals."

Story originally published in Business Today

Singularity University Features Female Entrepreneurs at CROWDFUNDxWOMEN



On December 6th, 2013, Singularity University hosted CROWDFUNDxWomen, a contest open to women-owned startups who are leading high growth & technology driven businesses, at its NASA Research Park campus. Ten finalists from the online contest pitched their startups to a room of investors, and a panel voted on a winner and runner up: 1-Page (CEO, Joanna Weidenmiller) and Switch Automation (co-founder and CEO, Deb Noller).

To read more about the event, visit: <http://bit.ly/1kLjq8J>

CROWDFUNDxWOMEN pitch event hosted by Singularity University

Wireless Technology for Space Applications

by Ahsan Ali, Business Development for Intrinsic Technologies

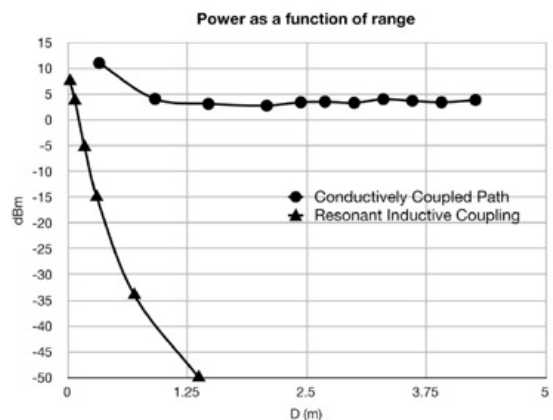
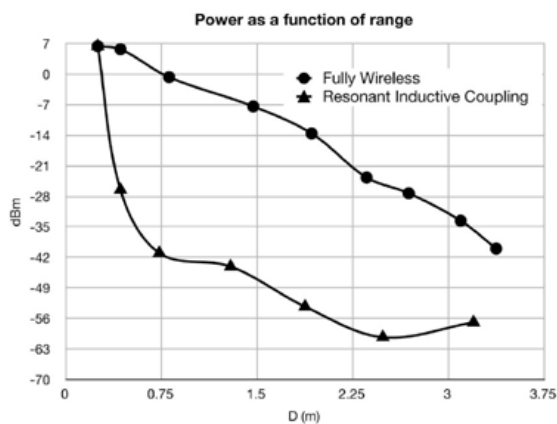
Intrinsic Technologies has partnered with Pabellon Technology to leverage Pabellon's unique wireless technology and Intrinsic's history of space systems development to pursue opportunities for space applications. Pabellon has developed a revolutionary technology for fully wireless and partially wired (conductively coupled path) power transfer usable over short, medium, and long range distances. They have designed, built, and demonstrated multiple and distinct very electrically small configurations of transmit and receive systems using these techniques. These systems work at a variety of power levels, possess both large and small form factors (standard printed circuit board implementation has been shown), and one transmitter to many receiver configurations have been demonstrated. Importantly, their systems have demonstrated novel efficiency as a function of range scaling laws that are distinct from the predictions of standard electromagnetic theory, but that are still compatible with standard electromagnetic theory.

Careful experiments have measured linearly decreasing efficiency with range for their fully wireless configurations and constant efficiency with range between transmitter and receiver for their conductively coupled path configurations. Theory of operation for their devices states that constant efficiency with range is possible

for fully wireless configurations. This is in contrast to resonant inductive coupling techniques using their devices with the "secret sauce" removed. The high-efficiency with range power transfer and electrically small nature of our systems allows for real-world space system application.

One immediate space application of high value is removing high mass and bulk spacecraft wiring harnesses. The spacecraft bus itself can be used as the conductively coupled path, which serves as an extremely low voltage return. Devices to be powered can simply be powered wirelessly with standard grounding techniques providing the low voltage return. This maximizes powered device placement options and eliminates power feeds through mechanical joints such as solar arrays. Data can also be transmitted and multiplexed concurrently with power. In another use case for this technology, the research team is exploring potential remote sensing of nearby objects (~100 meters).

In the coming weeks, Intrinsic and Pabellon plan to host technology demonstrations at the NRP open to the NASA and NRP community. For inquiries regarding the technology and upcoming demo days, email Ahsan Ali at ahsan@intrinsic.com.



NRP Post

NLSI cont'd from page 4

Photo by Teague Soderman



Former American astronaut, and the second person to walk on the Moon, Buzz Aldrin (right) talks with Ames staff about the future of lunar science.

way for students and the public alike to drive a small rover on simulated lunar terrain (located in the NRP); Exploration Uplink has been used to connect Ames to schools across the country and a host of nations including South Korea, South Africa and Canada. Citizen science is a major effort of the NLSI and now SSERVI; this effort was started by NAI founding director Baruch Blumberg, who NLSI brought on as its Distinguished Scientist. From identifying meteorite impacts on the Moon to sizing lunar craters, the public is increasingly contributing to important aspects of lunar science.

Scientifically, the Moon we know now is far different than the Moon we thought we knew only 5 years ago, and NLSI has had a major impact on this transformation. Thought for decades to have been a dry body, NLSI Principal Investigator Carle Pieters showed in 2009 that water is distributed widely (if thinly) across the Moon's surface at times. LCROSS and other mission data then showed that not only does water exist on the lunar surface, but there is a lot of it—enough (particularly in polar regions) to be used by future human missions. NLSI scientists showed that the Moon preserves the history of the early Solar System in a way that can shed light on its evolution. Models developed by NLSI, coupled with analysis of Apollo lunar samples with advanced technologies not available in the Apollo era, have revolutionized our understanding of the Solar System's beginnings. And NLSI scientists have shown that the far side of the Moon is an ideal astrophysics laboratory for observing a time in the history of the universe not previously seen—after the Big Bang, but beyond the reach of any visible or infrared telescope. Observations of this era of the universe—the so-called “Dark Ages”—will trace life's origins to a point beyond their very beginning, the formation of the first stars.

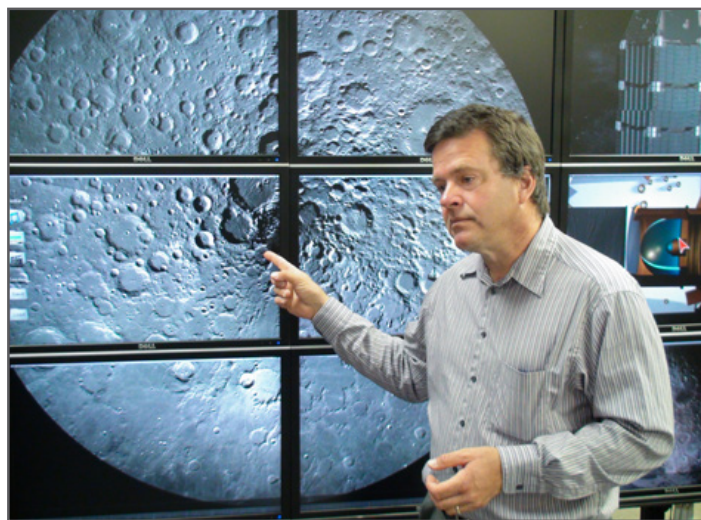
While pushing scientific boundaries, NLSI also pushed boundaries in the way science is done. With its national and international teams, NLSI has always had a challenge to connect scientists. As with the other Ames virtual institutes, NLSI lies in the middle of Silicon Valley and through its many partnerships, employs the best in new collaborative methods and technologies.

Being a virtual organization, much if not most of NLSI's business (and now SSERVI's) is focused on external organizations, and the central office is aided greatly by its location in the middle of the

NASA Research Park (NRP). NLSI has also sponsored projects and efforts within the NRP—examples include the Lunar Regolith Excavation Challenge in 2009, part of the Centennial Challenges program, as well as the ongoing Lunar Orbiter Image Recovery Project housed in the former McDonald's, which is bringing nearly 2,000 old Lunar Orbiter images from the 1960s to a greatly heightened clarity.

NLSI EXPANDS INTO SSERVI

With the Obama administration came a new strategy for NASA, based on the “flexible path” for human exploration of the Solar System. Although still a major target, the Moon is no longer the only one—Near Earth Asteroids, as well as (somewhat further along the line) the Martian moons Phobos and Deimos, are new and important destinations on the path toward eventual human exploration of Mars. Because of this, the NASA HQ sponsors of NLSI decided that its scientific emphasis should expand as well, to also include these Solar System objects. NLSI officially transitioned into the Solar System Exploration Research Virtual Institute (SSERVI) in July 2013, under the direction of Yvonne Pendleton, who had assumed the position of NLSI director in July 2010. SSERVI recently



Deputy Director Greg Schmidt

announced selection of its first teams and will be initiating science operations in February 2014. NASA HQ intends SSERVI to be an institute for decades to come as the agency forges ahead addressing the many scientific challenges in human exploration of the Solar System.

The Moon remains a critically important destination for NASA—for both exploration and science. The NLSI has had a major impact in all aspects of lunar science, both from the work it funded and the national and international community it supported.

NLSI PI David Kring of the Lunar and Planetary Institute in Houston perhaps put it best when he said, at the 2012 Lunar Science Forum, that “lunar science has changed more in the last 3 years than in the previous 30.” The more we study the Moon, the more questions are raised—and the more fascinating our cosmic companion becomes.

NeuroVigil Opens Satellite Research Lab at NASA to Develop Assistive Technologies for ALS

NeuroVigil, Inc. is setting to collaborate with a number of partners in the Silicon Valley where it is opening a satellite research laboratory at NASA Research Park in Mountain View, CA, to develop assistive technologies for individuals suffering from ALS and other conditions affecting the central nervous system. "We thank NASA for this wonderful opportunity and are excited to tap into the resonant energy, sense of urgency, innovation and consumer expertise of Silicon Valley and to provide talented individuals with impactful careers which contribute to the public good," said NeuroVigil's Founder, Chairman and CEO, Dr. Philip Low.



Dr. Philip Low, Founder, Chairman & CEO, NeuroVigil, Inc.

Based on Dr. Low's PhD research in Computational Neuroscience which yielded a mathematical framework to convert single-channel sleep and waking encephalography (EEG) into high-resolution maps of brain activity, NeuroVigil was able to create a wireless neurotechnology platform including an ultra-light device called the iBrain™ for comfortable at home EEG monitoring, and sophisticated algorithms to analyze the data and extract a bank of drug and pathology biomarkers. Since 2009, the Pharmaceutical Industry and elite academic institutions have made use of this neurotechnology platform to better characterize brain activity in response to compounds or neuropathologies.

In 2011, a kitchen table conversation between Dr. Low, and Dr. Stephen Hawking inspired Dr. Low to apply his technology for assistive purposes, including to enable patients with ALS to interact with their environment. "Dr. Low and his company have done some outstanding work in this field and I am pleased to be invited to collaborate with him and his colleagues,"

said Dr. Hawking. Dr. Low unveiled preliminary results from his collaboration with Dr. Hawking at the Francis Crick Memorial Conference in Cambridge, UK, in 2012, which Dr. Hawking attended as a guest of honor during the signing ceremony of the Cambridge Declaration on Consciousness, a document formally rejecting the Cartesian assumption that Consciousness is a phenomenon restricted to human experience alone. Additional results from the NeuroVigil study may be announced at Dr. Low's upcoming keynote address at Israel's First Brain Technology Conference.

The clinical trial on mind enabled communication for people living with ALS began in Philadelphia in 2012, with the participation of Dr. Terry Heiman-Patterson, Director of the MDA/ALS Center of Hope, funded by the ALS Hope Foundation. "My dream has always been to take the technology that is available in the here and now and apply that to improve the quality of life for people living with ALS and other disabilities. The potential of the iBrain to allow for

more effective communication, to allow for interfacing with environmental control and to provide potential biomarkers to track treatments brings that dream close to a reality. The impact will be immeasurable for people living with ALS..." said Dr. Heiman-Patterson.

NeuroVigil will keep its headquarters in La Jolla and will continue outreach efforts to veterans and Autism and ALS communities in Southern California, including work with Mr. Augie Nieto who was introduced to Dr. Low by Qualcomm's Chairman and CEO, Dr. Paul Jacobs. Mr. Nieto is the Founder of Life Fitness, the Chief Inspirational Officer of Augie's Quest, the co-chairman with his wife Lynne of the ALS division of the Muscular Dystrophy Association, having raised nearly \$40 million for ALS research and the Chairman of the ALS Therapy Development Institute in Cambridge, a world leading ALS center with over 50 employees and nearly 40 scientists entirely dedicated to ALS research. The collaboration was recently highlighted in the New York Times and in *Through the Wormhole with Morgan Freeman* where Mr. Nieto said: "The biggest fear for someone with ALS is to be not able to communicate! That is called being locked in. With the iBrain, I will never, never be locked in!"

Upon hearing the news of NeuroVigil's NASA satellite lab, Ekso Bionics co-Founder and CEO, Nathan Harding, said: "At Ekso Bionics, we consider the brain-machine interface to be the eventual destination of human eksoskeleton interface technology. So, it is very exciting to see one of the major players in the field establishing a base in the Bay Area for collaboration."

Source: NeuroVigil

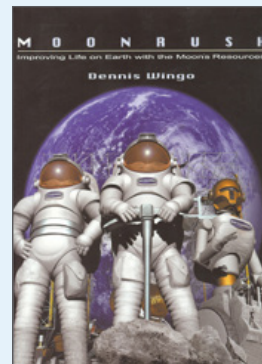
Lunar Image cont'd from page 5

a group of students (including Harper's kids Chris, Casey, and Travis) who helped us wash down 1960's electronics, which helped them to gain an understanding of the robustness of old technology vs the fragility of their smart phones. Another student who started with us in 2008 as a summer intern from San Jose State who has now graduated and matured into an amazingly competent engineer is Austin Epps. Neulyn Moss represents our new generation of students. She began with

us when she was in high school and is now studying physics at Foothill College. She is working to develop our methods of finding new craters using the difference between LROC NAC images and our Lunar Orbiter high resolution images.

So where are we now with the project? Keeping a 47 year old tape drive operational that is older than 50% of the American population has been just as hard as making

Lunar Image cont'd on page 24



Dennis Wingo's book, *Moon Rush: Improving life On Earth with the Moon's Resources*

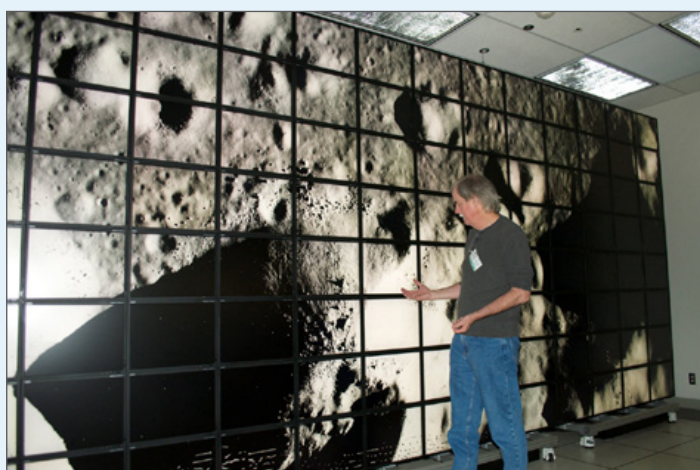


LOIRP Copernicus Mosaic Displayed on the Ames Hyperwall 2

it operational. Funding has also been a challenge. This was never a truly sanctioned NASA project though we have brought an amazing amount of positive publicity to the agency. We have persisted with a mix of some headquarters funding, some in kind support from Ames (McMoons itself), and recently we raised a total of over \$65,000 dollars through a crowd funding effort that has kept us going this year.

As far as tapes go, we have completed the capture of all of the 300+ tapes from Lunar Orbiter II, the 300+ tapes from Lunar Orbiter III, and we are more than half way through the 478 tapes from Lunar Orbiter V. We have a few tapes captured from the other two missions (Lunar Orbiter I, and IV). We currently are running between 5-15 tapes per day and hope to finish Lunar Orbiter V by the end of September, if our precious heads that read the tape hold out. It is our goal to have all of the tapes done by the end of the year and then complete the process of turning over 50 terabytes of raw image data into finished images, both of which will go to the Planetary Data System (PDS) for everyone to have access to. The images are also available on the NASA Lunar Science Institute's (Now the SSERVI) web site. Links to everything are also on our own site www.moonviews.com. A quasi daily progress report is also posted.

We also have some recent "wow" images to report. Epps took several Lunar Orbiter V images and turned it into the largest high



Dennis Wingo in front of the Ames Hyperwall 2



Ken Zin, Major the Boxer Dog and student intern Jacob Gold work on the equipment at the Lunar Tapes Lab

resolution mosaic of the Moon ever made, over 23 gigabytes. This image last week was provided to the NASA Ames Hyperwall 2 team and it was displayed on their 8x16 monitor hyperwall. Austin informs us that if this image was shown at its native resolution, it would take 50 hyperwall 2 size displays. The image is of about 45% of the floor of the famous lunar crater Copernicus, at 2 meter resolution!

So if you want to see the Moon in a way that we wish we could have seen it almost 50 years ago visit the website and track our progress and see our images! This adventure in technoarcheology would have never been possible without the unique character of Ames and the characters here who have been immensely supportive of our effort. The images will be used to form the basis of maps of the Moon and used to document the state of the Moon in the 1960's before industrial development and the cities where 50 million people now live. Oh, wait a minute that was from Star Trek in the 24th century. Don't we wish....

NRP Post

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